REPORT OF INDUSTRIAL USER COMPLIANCE SAMPLING INSPECTION

AT

**BIG OX ENERGY SIOUXLAND**
1616 D Avenue, South Sioux City, Nebraska 68776

NPDES Permit Number: IA0043095 (Sioux City Iowa STP)

ON

January 10 – 12, 2017

BY THE

U.S. ENVIRONMENTAL PROTECTION AGENCY
Region VII
Environmental Sciences and Technology Division

## INTRODUCTION

At the request of the Water, Wetlands, and Pesticides Division, Water Enforcement Branch, I conducted an Industrial User Compliance Sampling Inspection at the Big Ox Energy facility in South Sioux City, Nebraska, on January 10 – 12, 2017. The inspection was conducted under the authority of Section 308 of the Clean Water Act, as amended, and in accordance with EPA Region VII Standard Operating Procedures for Compliance Inspections (ENST SOP No. 2332). This narrative report and the attachments present the results of the inspection. Information about the South Sioux City, Nebraska, collection system and Sioux City, Iowa, pretreatment program collected from respective City officials are also included. An Industrial User Compliance Evaluation Inspection was also conducted at the nearby CHS, Inc., industrial facility. That inspection is briefly discussed herein. Full details may be found in the separate inspection report for the CHS facility.

## PARTICIPANTS

Big Ox Energy:
- Kevin Bradley, Business & Economic Development
- Jason Osbahr, Director of Project Development & Engineering
- Rob Ernest, General Manager
- Perry Winkler, Plant Manager

City of South Sioux City, Nebraska:
- Lance Hedquist, City Administrator
- Robert Livermore, Public Works Director

McClure Engineering Company:
- Tim Higgins, Technical Expert-Utilities

City of Sioux City, Iowa:
Desiree McCaslen, Pretreatment Manager
Jim Maynes, Wastewater Plant Superintendent
Justin Vondrak, Assistant City Attorney

CHS, Inc.:
Chris Oehler, Plant Manager
Scott E. Duncan, Environmental, Health, and Safety Coordinator
Jeremy MacClure, Plant Engineer

Nebraska Department of Environmental Quality (NDEQ):
Curtis Christiansen, P.E., NDEQ Central Office
Terry Johnson, Program Specialist, Norfolk Field Office

U.S. Environmental Protection Agency (EPA) Region VII:
Peter Green, Environmental Scientist
Lantz Tipton, Environmental Scientist

## BACKGROUND / FACILITY DESCRIPTION

Big Ox Energy Siouxland (BOE) is a waste-to-energy facility located in the Roth Industrial Park in South Sioux City, Nebraska (map, aerial photos-Attachment 1). The facility was constructed in 2016 and was issued a Significant Industrial User Wastewater Discharge Permit by the City of Sioux City, Iowa, on May 1, 2016. It began operating on September 2, 2016, and began discharging wastewater on or around September 12. There are currently around 35 employees at the facility, which operates in three shifts around the clock. The pretreatment permit lists Standard Industrial Code 2869; Resource Recovery and Manufacturer of Industrial Organic Chemicals. The plant utilizes two types of wastes to feed anaerobic digesters which produce methane gas. When fully operational, the gas produced will be scrubbed, compressed, and conveyed to an interstate pipeline.

The facility takes up to 1.8 million gallons per day (MGD) of industrial wastewaters piped in from three nearby industries through the South Sioux City collection system: CHS, Richardson Milling, Inc. (RMI), and Beef Products, Inc. (BPI). It also takes approximately 0.2 MGD of liquid industrial wastes that are trucked in.

Prior to the start-up of BOE, wastewater from these three industries was pumped from the Roth Lift Station to a gravity sewer along C Avenue. The C Avenue line flows north into the 39$^{th}$ Street sewer, which continues east to Bennet Avenue, then north to the Bennet Lift Station. Combined with flows from the Floyd Lift Station, they are then pumped underneath the Missouri River to the Sioux City Iowa Sewage Treatment Plant (STP). The Bennet Lift Station was built in 2007 and is equipped with three pumps, each with a capacity of 1800-2000 gallons per minute (gpm) (total capacity ~ 7.8 MGD). (Note: Most of the recent odor complaints and high $H_2S$ measurements are clustered around neighborhoods along the 39th Street gravity sewer, both west ["upstream"] and east ["downstream"] of the line coming into it from C Avenue, and on Bennet Avenue just south of the point where the line turns north).

The industries paid the City of Sioux City based on a two-tier fee structure; discharges of 5-day biochemical oxygen demand (BOD5), fats, oils, and grease (FOG), and total suspended solids (TSS) in excess of domestic concentrations (300 mg/L, 100 mg/L, and 250 mg/L, respectively) were charged one rate, and higher concentrations (>1200, 400, or 2000 mg/L) were surcharged at a higher rate.

Since the BOE facility came on line, the industrial wastewaters from these three industries have been pumped to BOE for preliminary treatment before being returned to the South Sioux City collection system. The industries now pay the City of South Sioux City, which has a one-tier fee structure based on volume, BOD, FOG, and TSS. Their pretreatment permits issued by Sioux City, Iowa (Attachment 2) will expire in April 2017 and will not be renewed. South Sioux City's current sewer use ordinance has limits for only one wastewater parameter-pH, which is limited to 5.0 9.5. The City plans to adopt additional sewer use requirements and/or pretreatment permits in consultation with the affected industries before their current permits expire in April.

A Tipping Agreement (obtained from the City through a §308 information request) between the City of South Sioux City and BOE requires the City to pay BOE a guaranteed minimum payment of $225,000 per month to pre-treat the industrial wastes from the three industries. Under the terms of the agreement, BOE is required to accept those wastes. In turn, BOE pays user fees to Sioux City, Iowa, based on their two-tier fee structure to treat their wastewater discharges at the Sioux City STP.

Process flow diagrams are included in Attachment 3. The first diagram was provided by BOE to the EPA in response to a §308 information request. The second, larger flow diagram was provided by Mr. Osbahr during the inspection and contains more detailed information. Processing of the two "feedstocks"; 1) industrial wastewater and 2) trucked-in liquids; are as follows:

1) Industrial Wastewater: Industrial wastewater coming into the BOE facility (~1.8 MGD) enters a [redacted] wastewater equalization tank that is the feed tank for the dissolved air flotation (DAF) system. This tank has an overflow port that discharges directly to the sewer. Wastewater pumped out of this tank passes through a rotary screen and is split into two parallel DAF systems (one tank with two chambers; photo 10). The GEM ("gas energy mixing") DAF system is a newer DAF technology that allows greater process control and higher throughput with a smaller footprint than conventional DAFs (www.cleanwatertech.com). The process is run at a pH of approximately [redacted] and is shut down if the pH reaches [redacted] Ferric chloride and both anionic and cationic polymers are used to promote coagulation and optimize separation. The stainless steel DAF is fully enclosed and is vented through a passive air scrubber system to the roof. Each of the two parallel tanks has a flow capacity of 1050 gpm (1.5 MGD each). The design capacity was based on the volumes of wastewater discharged by the three industrial dischargers in 2014. One or both sides can be operated as necessary to handle the flows. Mr. Osbahr said that BOE would handle future growth by adding a second GEM DAF tank (doubling their capacity from 3 MGD to 6 MGD.) The solids which float to the top of the DAF tanks are skimmed off and stored in two sludge tanks. The "float" or sludge (currently about 40,000 gallons per day, or gpd), is then transferred to the [redacted] equalization/mix tank at the north end of the plant where they are mixed with trucked-in liquid wastes used as food for the anaerobic digesters. The DAF effluent is discharged to an effluent pit along with any overflow from the DAF equalization tank and is pumped to the sanitary sewer. The average pollutant concentrations in BOE's effluent discharges in September and October were: BOD~1800 mg/L; FOG~ 63 mg/L; TSS~700 mg/L.

2) Hauled-in Wastes: BOE also takes in approximately 0.2 MGD of non-hazardous liquid industrial wastes hauled in by truck. These shipments are a primary feedstock for the anaerobic digesters and they are carefully scheduled in advance to ensure an appropriate mix of food for the digesters. The tanker trucks are unloaded in an enclosed bay at the north end of the building into two receiving pits (photos 13, 14). On the day of this inspection, 18 truckloads of paunch manure were hauled in from the nearby Tyson Fresh Meats beef processing facility. This was more than half of the wastes received that day. Mr. Osbahr said that this was fairly typical. Packaged products (e.g., expired canned pet food) are also

received here. They are depackaged by machine and mixed with the trucked-in wastes in a [redacted] receiving tank. The wastes from this tank, along with the receiving pits, are transferred to a [redacted] equalization/mixing tank for liquid industrial wastes. The mixed wastes are then pumped through a heat exchanger into two [redacted] anaerobic digesters, which are plug-flow and operated in series. Blood protein meal, seed enzymes, and bacteria are added as needed to optimize biological processes in the digesters. Mr. Osbahr said that the pH in the digesters typically starts at approximately [redacted] at the beginning of the primary digester and increases to about [redacted] by the end of the secondary digester. The digester gas normally consists of approximately 2/3 methane and 1/3 carbon dioxide, with a few parts per million (ppm) of hydrogen sulfide. A pressure relief valve maintains a pressure of approximately 0.75 psi. The gases are collected and piped to a gas cleanup pad at the southwest end of the plant property. When the plant is fully operational, the gas produced will flow directly into a gas pipeline. To date, however, all of the gas produced has been flared off. The gas cleanup system was being prepared for startup at the time of this inspection.

The digested wastes emerging from the secondary digester contain ~10% to 18% solids. They are pumped to two parallel centrifuges (photo 16) for dewatering. The finished sludge is very dry (50% - 60% moisture), lightweight, and fibrous in nature. It is loaded through a hopper onto semi-trucks staged inside the building (photo 9). Currently, all of the sludge is being hauled to a landfill, but BOE expects to sell it in the future as a fertilizer/soil amendment. The centrate (liquids separated in the centrifuges) is conveyed to a wet well which also captures all the floor drains in the building. From there, they are pumped to the DAF feed tank where they are blended with the screened industrial wastewater to be treated in the DAF.

In summary, there are two waste treatment processes at this facility: 1) industrial wastewater is treated through a DAF system; and 2) more concentrated trucked-in wastes are processed through anaerobic digesters. The two processes are connected at two points: 1) solids from the industrial wastewater (DAF skimmings) are added to the anaerobic digesters; and 2) liquids from the digested, trucked-in wastes (centrate) are mixed with the industrial wastewater being sent through the DAF. This means that the chemistry in the DAF system is influenced by the contents of the digesters, and the digester chemistry/biology can be affected by floated solids from the wastewater stream.

The tanks and equipment in the plant are monitored through a plant-wide SCADA (supervisory data acquisition and control) system. There are display panels distributed throughout the plant, and the system can also be accessed from remote locations by authorized staff.

Operational History: The BOE facility began accepting industrial wastewater for the first time on September 2. It began discharging treated wastewater several days later. On October 31, following public odor complaints, BOE agreed to stop taking in industrial wastewater. On or around November 2, they stopped discharging wastewater. The DAF equalization tank was drained and cleaned out. The industrial wastewaters were diverted around the BOE treatment system directly into the South Sioux City collection system (the same flow pattern that had existed prior to BOE'Ss startup). In order to keep the biology alive in the digesters, BOE continued to take in hauled-in wastes. They continued to operate the centrifuges and the centrate (up to 150,000 gallons per day) was hauled by tanker truck directly to the Sioux City STP. Some odors generated during the filling of tankers outside the building were the subject of complaints. Mr. Osbahr said the odors were generated by the venting of air through ports in the top of the tankers as it was displaced by wastewater during filling.

In their efforts to control sulfides in the gravity sewer along C Avenue, the City installed a 4200-gallon Bioxide tank and injection pump at a manhole in front of entrance drive to the BPI (Beef Products, Inc.)

facility. They began injecting Bioxide (a formulation containing nitrogen, which ties up the sulfide ion) on November 2. The City also installed hydrogen peroxide injection points near the Archer Daniels Midland (ADM) facility (photo 1), at the Bennet Street Lift Station, and at 39th and G Avenue.

On Wednesday, January 4, at 5 p.m., BOE began accepting industrial wastewater again and resumed the discharge of treated wastewater to the city sewer.

Hydrogen Sulfide ($H_2S$) Levels: A comprehensive analysis of the factors contributing to odors and $H_2S$ in the South Sioux City collection system is beyond the scope of this report/inspection. But a number of factors can affect the amount of $H_2S$ observed in the collection system. Sulfides and sulfates are common constituents of industrial and domestic wastewaters. Under anaerobic conditions, sulfates and organic sulfides are reduced to inorganic sulfide. In low pH or acidic conditions, odiferous hydrogen sulfide gas is generated. In the presence of air, the $H_2S$ forms sulfuric acid which can cause severe corrosion in the collection system. The rate of $H_2S$ generation and/or accumulation depends on the type and concentration of sulfides, the slope of the pipe and velocity of flow, and the surface area of the air/water interface. Turbulence in the sewer system (for example, at the point where the C Avenue line dropped into the 39th Street sewer line) generally causes local spikes in $H_2S$ levels. Dry sewer traps in homes, or the lack of proper venting, may allow sewer gas to enter the structure.

Mr. Osbahr told us that when the plant began accepting wastewater on Friday, September 2, the influent pH measured in the DAF equalization tank dropped from around 8 to 3.9 within hours. To cause this, he suspected that one of the industries had to be discharging wastewater with a pH less than 2. He stated that the same thing happened again the following weekend. The low pH wastewater caused an upset in BOE's processes, ultimately leading to a souring of the digesters, according to Mr. Osbahr. Since the BOE facility started up in September, several workers and/or contractors have been hospitalized; at least one due to $H_2S$ exposure.

The anaerobic conditions necessary for BOE's digesters to function properly also favor the reduction of sulfur-containing organic compounds to sulfides. Any hydrogen sulfide volatilized in the digesters is carried out with the methane to the flare. When BOE begins capturing the methane to sell, they plan to continue to flare off the $H_2S$. Eventually they plan to capture the $H_2S$ in the form of a pelletized sulfur.

There are several other industries in South Sioux City with the potential to contribute sulfates and/or low-pH wastewater to the collection system. ADM Alliance Nutrition and Bimbo Bakeries discharge to the 39$^{th}$ Street gravity sewer, upstream (west) of the point where the C Avenue sewer flows into it.

South Sioux City Collection System Upgrades: As mentioned earlier, BOE stopped discharging wastewater on November 1. On November 2, a rubber plug was placed in the 36-inch gravity sewer along 39th Street just west of C Avenue to isolate the residential sewers from the wastewater and associated gases from the C Avenue sewer line. This diverted the sanitary wastewater (and industrial wastewater, including ADM and Bimbo Bakeries) north to the Foundry Lift Station. For residential lines along Bennet Avenue and along 39$^{th}$ Street downstream of the C Avenue sewer, the City is installing Tideflex valves to prevent the backflow of industrial wastewater.

> Phase 1: On November 29, NDEQ issued a construction permit for a new 4400-foot long, 16-inch industrial force main to be installed alongside the existing gravity line from 39th and C Avenue to the Bennet lift station. The City purchased the pipe and BOE reimbursed them (approximately $1 million) for the costs of construction. The force main is joined into the lift station wet well at the bottom to minimize the volatilization of $H_2S$. A temporary lift station was

installed just southeast of the intersection of G St. (C Avenue) and 39th Street to pump wastewater from the C Avenue gravity line into the new force main. A second plug was placed in the C Avenue sewer line just south of 39th Street to create a wet well to pump from. The City has had issues with these rubber plugs leaking and have replaced one of them at least once. The lift station, consisting of an 8-inch electric pump (capacity 3800 gpm) and emergency generator, went on line on December 13. A second pump, a 6-inch diesel pump (3000 gpm) was installed on December 20. Several days after BOE resumed discharging on January 4, one of the pumps froze. This was attributed to an interruption in flow from the BOE facility combined with extremely low ambient temperatures (< 10°F). The pump was replaced, and thermal blankets have been placed around the pumps and piping to prevent freezing. The City was also planning to install heat tape and a pole building to protect the pumps. BOE agreed to avoid interruptions in flow without notifying the City first.

The City began injecting 50 gallons of hydrogen peroxide per hour into the sewer below the ADM facility on November 16. The dosing rates have since been reduced to around 10-15 gph. The line from Bimbo Bakeries was flushed on November 12. Elevated $H_2S$ levels were reported in the sewer at 39th and Dakota Avenue on November 17-18 despite these efforts to isolate the residential lines from the Roth Industrial Park wastestreams. This line was being cleaned daily, according to recorded minutes from a November 22 meeting with the City and BOE, but the $H_2S$ levels continued to spike at 50 to 100 ppm.

To mitigate odors at the Bennet Lift Station, BOE also hired a contractor to install a rubberized cover over the wet well. This was completed on December 15. Photo 5 shows the cover and two vents which have been equipped with activated carbon filters. They plan to install two more.

Now that the industrial force main along 39th Street has been completed and the industrial wastewater from the Roth Industrial Park no longer travels through the gravity lines, the plug has been removed from the 39th Street line. Wastewater from the residential areas and industries north of Highway 20 once again flows east by gravity to the Bennet Lift Station.

Phase 2: Plans are now being prepared for a new 16-inch force main to be constructed along C Avenue (parallel to the existing gravity line) to connect with the force main recently completed. The temporary lift station will then be removed and industrial wastewater will be pumped all the way from BOE'S existing lift station to the Bennet Lift Station. McClure Engineering, who designed the new force main along 39th Street, is preparing the plans. It is being funded by the City of South Sioux City with likely grant assistance from the Department of Commerce's Economic Development Agency. The existing effluent pumps at the BOE facility have the capacity to convey 3 MGD all the way to the Bennet Lift Station. Mr. Osbahr told me that, for the sake of efficiency, the pump impellers will be changed. During the week of this inspection, easements were being prepared for the project. State and Federal permits will be obtained to cross under Highway 20. Mr. Hedquist said that he expected construction to begin as early as March, weather permitting. On February 1, Mr. Osbahr said that he thought the project should be completed in June.

In a third phase being planned, an extension will be added to the new force main to route *around* the Bennet Lift Station. The industrial wastewater will then bypass the Bennet lift station and tie in to the force main downstream of the pumps. The City had been planning to install a biofilter at the Bennet lift station to control odors, which is similar to a system installed at the Riverlift Lift Station. Mr. Osbahr said that this may not be necessary if their wastewater is diverted

around the lift station, since it will never come into contact with air until it reaches the wet well at the Sioux City STP.

A new residential/commercial development just northeast of the Bennet Lift Station is in the design stages. Wastewater from the expected ~1000 new units will be conveyed to the Bennet Lift Station.

## INSPECTION PROCEDURES

This inspection was requested by WENF after a number of odor complaints were received from area residents and news accounts reported problems at the facility. We contacted Ms. McCaslen the week before the inspection and arranged to meet her on Monday afternoon, January 9, 2017, at the Sioux City STP. We arrived at 4:30 pm and met with Ms. McCaslen and Mr. Maynes. We briefly discussed the Sioux City pretreatment and industrial monitoring program, the significant industrial users in South Sioux City, and the recent resumption of operations at the BOE facility.

The following morning, Mr. Tipton and I met Messrs. Christiansen, Johnson, Hedquist and Livermore at the South Sioux City City Hall. Immediately before we arrived, Mr. Hedquist was contacted by John Smith of the Region VII Air and Waste Management Division to inform him that a mobile unit was being deployed that morning from EPA Region V in Chicago, in cooperation with Region VII, to assess ambient $H_2S$ in the vicinity of the BOE facility. He also announced that we would be arriving shortly to inspect the BOE facility and gather information about the City's and industry's efforts to mitigate these issues. We introduced ourselves, presented our credentials, and discussed the purpose and scope of our visit. After some discussion of the City's ongoing efforts, we sat in on the daily conference call between the City Administrator, the Public Works Director, McClure Engineering, and the Sioux City pretreatment manager. These meetings are being conducted every weekday morning at 10 a.m. BOE is normally represented at these meetings but Mr. Bradley was not in attendance.

Following the conference call, the four of us (Messrs. Christiansen and Johnson from NDEQ and Green and Tipton from EPA) proceeded to the BOE facility. We identified ourselves to the guard at the security gate and were waved through. We knocked on a door on the west side of the building and were admitted by a plant worker. After identifying ourselves, we were greeted by Messrs. Bradley, Osbahr, Ernest, and Winkler. We presented our credentials and outlined the purpose and scope of the inspection. Using the process flow diagram (Attachment 3), Mr. Osbahr described the plant processes and operation. He then escorted us through the plant. With his assistance, I collected a grab sample of the effluent from the DAF system.

On Wednesday, January 11, after meeting with Ms. McCaslen at the Sioux City STP to split effluent samples, we met Messrs. Christiansen and Johnson at the CHS industrial facility and conducted an industrial user inspection. The findings from that inspection are presented in a separate report. From there, we proceeded to the South Sioux City Public Works facility and met with Mr. Higgins. He escorted us to several points in the collection system, including the temporary lift station, the Bioxide injection site outside the BPI facility (no longer in use), the peroxide injection site near the ADM facility, the Bennet Lift Station, and the Foundry Lift Station. We returned to the BOE facility. Mr. Osbahr gave me a copy of the facility Storm Water Pollution Prevention Plan (SWPPP-Attachment 4), and pulled a grab sample of the effluent from the DAF for a visual inspection.

On Thursday, January 12, we met Ms. McCaslen at her office at the Sioux City STP and obtained another split sample of the BOE effluent from her. Mr. Tipton and I then returned to the BOE facility.

With Mr. Osbahr, we did a walk-through inspection of the property and storm water outfalls. I issued a Notice of Potential Permit Violations (NOPV-Attachment 5) for failure to conduct the required storm water site inspection, visual monitoring, and storm water sampling for the fourth quarter of 2016. We discussed the facility's rights with respect to confidentiality. Mr. Osbahr signed the Confidentiality Notice (Attachment 6) requesting that the process flow diagram be handled as confidential business information (CBI).

On January 31, I left a voicemail message for Mr. Osbahr with a few questions, and to get an update on the plant. He returned my call the following morning. Two days later, I received a copy of the NOPV response (which had already been submitted to CNSL with the §308 request response). I also contacted Ms. McCaslen for more information about the industrial sewer charges. She also forwarded slug loading reports she had recently received from CHS.

Sampling Procedures: I collected two 24-hour composite samples of the plant effluent from the effluent discharge pit on Tuesday and Wednesday, January 10 and 11. The samples were collected using the Isco Model 5800 flow-composited refrigerated automatic sampler (photo 12; property of BOE, programmed by Ms. McCaslen) and represented the wastewater discharged beginning and ending at midnight. Although I brought an EPA automatic sampler capable of collecting time-proportioned composite samples, installing it would have required either removing the steel plate from atop the discharge pit (photo 11) or drilling a hole in it. Either of these would have potentially exposed nearby plant workers to hydrogen sulfide gas which may have accumulated in the pit. I therefore elected to take a split of the samples collected by the City of Sioux City. Each morning, Ms. McCaslen retrieved the collection bottle and transported it to the Sioux City STP. We met her there and collected a split sample by thoroughly shaking the bottle before filling individual sample containers pre-labeled for analysis of the parameters BOD, COD, TSS, total Kjeldahl nitrogen (TKN), ammonia-nitrogen, and nitrate/nitrite. I measured the pH of the composite sample collected on Tuesday using a portable meter. It was 6.93, but the sample had been sitting for several hours in the refrigerator at the Sioux City STP. For purposes of reporting under a National Pollutant Discharge Elimination System [NPDES] Permit, pH values must be measured within 15 minutes of sample collection, since the pH may drift up or down over time. The sample collected on Wednesday did not represent the full 24 hours since power to the sampler was interrupted for several hours. The power was cut off in order to replace the universal power supply for the building.

On Tuesday, January 10, with Mr. Osbahr's assistance, I also collected a grab sample of the discharge from the dissolved air flotation (DAF) tank. Mr. Osbahr cautioned me that the effluent quality was not satisfactory and that the operators were working on optimizing the DAF chemistry. I measured the pH of the effluent at 6.83 using a portable meter. The next day, we pulled another grab sample for visual examination (photo 8). The effluent quality had improved dramatically, from a black, opaque, sludge-like appearance to a beer-like color and transparency.

When we returned to the plant on Thursday, January 12, the DAF was shut down. A consultant from US Water was conducting jar tests to optimize the DAF process and was waiting on a fitting he had ordered to repair the polymer feed system. When the DAF is shut down, incoming wastewater is collected in the DAF feed/equalization tank. If the tank overflows, the excess carries over to the discharge pit where the composite sampler and discharge pumps are located.

## FINDINGS AND OBSERVATIONS

Attachment 7 contains photographs taken during the inspection. Attachment 8 is a completed Multimedia Screening Checklist completed for the facility. Attachment 9 is the laboratory report for the samples I collected.

**1. Pretreatment Permit**: BOE's industrial pretreatment permit (Attachment 10) was originally issued on May 1, 2016, and expires on January 13, 2020. The permit contains effluent discharge limits for pH only (5.0 – 11.5). It authorizes the City of Sioux City to impose wet weather flow curtailments and volumes/rate and time of day schedules for the facility's discharge.

Attachment 11 is the permit application submitted by BOE on June 6, 2015. The facility's Standard Industrial Code is 2869 – Resource Recovery and Manufacturer of Industrial Organic Chemicals. At the time of this inspection, Ms. McCaslen thought that the categorical standards for Centralized Waste Treatment Facilities (40 CFR 437, Subpart D) would apply to the BOE facility. Baseline monitoring had been started but not completed since the plant had been in operation for less than two months before shutting down. She said that ninety days of monitoring would be conducted before permit limits would be finalized for the facility, and these might include TSS limits. After consultation with Paul Marshall in Region VII/WWPD/WENF, it was determined that the facility was non-categorical. The permit was amended on January 31, 2017, to reflect this (Attachment 12).

The relationship between the Sioux City STP and the BOE facility is unique, Ms. McCaslen pointed out, since the facility is both a privately-owned wastewater treatment facility and an industrial user. Currently, both BOE and the industries discharging into it are permitted under Sioux City's pretreatment program. However, since Sioux City's capacity for future growth is limited by the capacity allocated to existing industrial users, the capacity allocated to BOE cannot *also* be allocated to the industries which discharge to it.

Effluent Monitoring: BOE's pretreatment permit only specifies monthly monitoring of pH, but Sioux City has additional monitoring requirements for industrial users discharging more than 25,000 gallons per day (gpd). These include weekly composite samples for BOD*5*, TSS, total nitrogen (TN) and total phosphorus (TP), and weekly grab samples for fats, oils, and grease (FOG) and pH. Composite samples are currently being collected every day (when possible) by Ms. McCaslen in order to complete 90 days of baseline monitoring. The composite sampler (photo 12) is equipped with four large collection bottles, so four consecutive 24-hour composite samples can be collected before they must be retrieved. (This practice may result in the holding time for BOD [@40 CFR §136] being exceeded for some of the samples. However, the results are only used for the purpose of computing surcharges, not for compliance purposes; there are currently no permit limits for BOD or TSS.) The facility has allowed the City timely access to the sampler, according to Ms. McCaslen. Ms. McCaslen said that after the initial 90 days of monitoring, the City will continue to sample daily but may analyze samples selected at random (i.e., a different day each week) for BOD and TSS.

*Recommendation:* To better certify the integrity of the samples, the City of Sioux City should lock the sampler. A key could be provided to BOE with a custody seal so they could access the sampler when necessary, while documenting the circumstances and timing.

The effluent pit is not equipped with a pH probe, and there are no provisions for pH adjustment of the effluent. Plant staff do monitor the pH of the DAF effluent throughout the day and occasionally at a downstream sewer manhole (Attachment 18). The effluent pH is measured monthly by Sioux City when

they pick up the composite effluent samples.

**2. Discharges from Contributing Industries:** All three of the industries in the Roth Industrial Park have pretreatment permits issued by the City of Sioux City that expire on April 14, 2017. The permits were issued with effluent limits for pH and TSS, but the TSS limitations were waived in April 2015 because the Sioux City STP receives less than 80% of its treatment capacity for TSS. Effluent pH is restricted to within a range of 5.0 to 11.5.

CHS produces soy protein powder from defatted soy flakes. CHS discharges process wastewater (~0.4 MGD) to a gravity line where it is combined with their domestic wastewater and flows to the Roth Industrial Park Lift Station (which was constructed in 2007). The lift station then pumps it directly to BOE. BPI manufactures sausages and discharges approximately 0.7 MGD. Wastewater from BPI is pumped directly to the BOE facility. Richardson Milling (RMI) is a grain processor that produces granola. Wastewater from RMI (~0.01 MGD) flows by gravity to BPI's lift station and is pumped to BOE.

Both lines coming into the BOE plant have manual valves to divert them directly to the gravity sewer. The City of South Sioux City controls these valves. When the new force main to Bennet Lift Station has been completed, the gravity sewer will no longer be used. All of the flows from Roth Industrial Park will *have* to go through the BOE plant to their lift station, to be pumped through the force main.

Attachment 13 contains billing records for September through December for the contributing industries CHS, BPI, and RMI. Below are tabulated the average volumes and BOD and TSS concentrations for the three industries over the last four months. (Although the number of samples varied from month to month, I weighted every sample equally in calculating these averages.) I also computed average *loadings* (shown in italics) from the average volumes and concentrations:

| | $BOD_{avg.}$ | | $TSS_{avg.}$ | | $Flow_{avg.}$ |
|---|---|---|---|---|---|
| Industry | (mg/L) | *(pounds/day)* | (mg/L) | *(pounds/day)* | (MGD) |
| CHS | 4,412 | *14,608* | 1,552 | *5139* | 0.397 |
| BPI | 471 | *2860* | 325 | *1973* | 0.728 |
| RMI | 14,325 | *1242* | 1,020 | *88.5* | 0.0104 |
| Total (CHS+BPI+RMI) | 1,976 | *18,710* | 760 | *7201* | 1.1354 |

Of the three industries contributing wastewater to BOE, BPI discharges the highest volumes, but CHS contributes significantly greater loading in pounds per day of BOD and TSS. RMI's wastewater has higher concentrations of BOD, but they discharge very low volumes. The combined wastewater from the three industries is not sampled or monitored, but I added up their average pollutant loadings to arrive at *hypothetical* average concentrations for the combined wastestreams (Total CHS+BPI+RMI).

**3. Discharges from BOE:** The corresponding billing records for BOE are in Attachment 14. The facility was only discharging from September 12 through October 31. The corresponding two-month averages were as follows:

| | $BOD_{avg}$ | | $TSS_{avg.}$ | | $Flow_{avg}$ |
|---|---|---|---|---|---|
| Industry | (mg/L) | *(pounds/day)* | (mg/L) | *(pounds/day)* | (MGD) |
| BOE | 1,809 | *15,872* | 731 | *6414* | 1.052 |

Even though BOE'S effluent contained about 10% centrate (from the digester centrifuges) and a large volume of untreated wastewater (see discussion below), the average effluent concentrations were still slightly lower than those of the combined incoming wastewater.

BOE'S billing records for September and October list the daily volumes for two effluent wastestreams: "treated" and "untreated". "Treated" wastewater is industrial wastewater (with ~5-10% centrate mixed in) that has been treated through the DAF system, while "untreated" wastewater is overflow from the DAF equalization tank (not treated through the DAF system). The untreated wastestream is metered separately and combined with treated effluent in the discharge pit, where the effluent samples are collected. Most of the industrial wastewater discharged in September and October was *not* treated; 81.4%, on average (74% in September and 90% in October).

Based on information I gathered from Mr. Osbahr and Ms. McCaslen, there were two reasons for discharging *untreated* wastewater: 1) The operators experienced numerous problems with the DAF system over the first several months. When one or both sides of the DAF were shut down, incoming wastewater accumulates in the equalization tank. When the tank capacity is exceeded (>350,000 gallons), an overflow pipe conveys the excess to the discharge pit. 2) When the plant first started up, it was necessary to ramp up the DAF process gradually in order to avoid too sudden a decrease in the organic loading to the Sioux City STP. According to Ms. McCaslen, this could shock the biological organisms in the activated sludge process, especially in the fall when the plant was adjusting to falling temperatures.

Mr. Osbahr said that BOE'S goal is to treat 100% of the industrial wastewater through the DAF system. Since they resumed operations on January 4, they have treated nearly all of the wastewater they received. On February 2, Ms. McCaslen sent me the discharge volumes for the month of January (Attachment 15). They discharged for 26 of the next 27 days (an average of 1.307 MGD) and the equalization basin overflowed on only one day.

Since BOE was not discharging to the sewer in November and December, the billing statements for those months show charges for treatment of wastewater hauled by truck to the Sioux City STP. Between November 11 and December 31, they hauled, on average, 19 trucks per day (110,000 gpd), and as many as 31 trucks in a day, of centrate from the digester centrifuges. Every load was tested by the Sioux City lab for BOD and TSS. The hauled centrate had significantly higher average pollutant concentrations (BOD-3872 mg/L; TSS-6992 mg/L), but were only about one tenth of the volume of the wastewater discharged in September and October.

**4. Discharges to BOE from CHS:** CHS processes soy flakes to produce protein powder. The facility was built in 2008 and acquired by CHS in 2012. They discharge, on average, 0.4 MGD of wastewater to the city sewer. The protein product is isolated using centrifuges, which discharge wastewater with high starch content. Wastewater is also generated through clean-in-place (CIP) processes (approximately every 5 days), water softener backflush, boiler blowdown, and reverse osmosis reject water.

CHS' process wastewater is generally acidic (pH~5-5.5), while the CIP wastewater is alkaline. The wastewater is continuously pH-adjusted with caustic or hydrochloric acid in a 30,000-gallon tank at the southeast corner of the facility. It is then discharged to a gravity sewer leading to the Roth Lift Station. A pH probe mounted inside a "kidney loop" (see photo 17) controls the caustic and acid feed pumps. The set points programmed in to the automated system trigger the caustic pump if the pH falls to 5.5, and stop it when it reaches 6.0. The acid pump is triggered when the pH is between 9.7 and 9.2.

The City of South Sioux City collects sewer use fees from CHS, but they contract the City of Sioux City to conduct the monitoring and compute the user surcharge fees. Attachment 13 contains billing statements for September through January. Surcharges are applied to the excess TSS, BOD, and FOG discharged above domestic concentrations (300 mg/L, 250 mg/L, and 100 mg/L, respectively). A flow-proportioning composite sampler collects samples several times a week from the discharge pit. The samples are picked up by Ms. McCaslen and analyzed at the Sioux City STP laboratory. CHS reports the average hourly effluent pH.

Until April 2015, CHS' pretreatment permit had a TSS limit of 700 ppd. This was exceeded nearly every month (Attachment 16). According to Ms. McCaslen, the previous owner (Solbar USA) was put on a compliance schedule to reduce their solids discharges, and this was transferred to CHS when they took ownership of the plant.

Comparing CHS' effluent with the total combined wastewaters discharged by CHS, BPI, and RMI, the CHS facility contributed 35% of the hydraulic loading, 78% of the BOD, and 71% of the TSS sent to BOE.

Tank Dumps: Ms. McCaslen forwarded to me nine emails she received from CHS since last August, reporting slug loads or releases of noncompliant wastewater. (The last two were reported *after* this inspection.) The reports are also sent to BOE. The issue on January 29 was a faulty hydrochloric acid pump which resulted in the discharge of approximately 8000 gallons per hour of alkaline wastewater for about 13 hours. The other eight incidents were tank dumps. These resulted in slug loads of about 900 pounds of solids, on average, to the sewer. Although this represents only about 12% of the amount of solids typically discharged every day, the discharge of concentrated slugs can shock biological wastewater treatment systems.

*Recommendation:* CHS should always notify the City and BOE facility in advance before dumping any concentrated wastewater to the sewer. They should also consider installing a holding tank with enough capacity to hold such wastes and discharge them slowly in order to prevent slug loading of BOE's treatment processes.

Effluent pH: Mr. Osbahr reported that BOE had received acidic wastewater on numerous occasions and that they had caused problems with BOE's processes. The first time this happened was shortly after the initial startup on September 2. Mr. Osbahr said that the influent pH dropped from around 8 to 3.9 in a few hours, and that it happened again the following weekend. He suspected that one of the industries had been discharging wastewater with a pH as low as 2. He told me that the DAF automatically shuts down if the pH drops below 5.0. Over the following weeks, BOE's digesters became upset and the methanogenesis process was ultimately halted. Mr. Osbahr attributed the plant upset to the low pH wastewater (although the mechanism for this upset process was not entirely clear to me.) CHS was the suspected source of these acid slugs, since BPI, the other possible source, has extremely tight control over their effluent pH and never discharge low pH (even though a lower pH would profit them by boosting the amount of grease they could recover in their DAF). Mr. Osbahr said that incoming wastewater with extremely low pH levels had been observed on numerous occasions and again last week. When we walked through the plant on Tuesday, a pH readout panel on the wastewater equalization tank indicated a pH of 6.4, well within the permitted range. Between the discharge pit at CHS and the wastewater equalization tank at the BOE facility, there are no monitoring ports or probes. By the time CHS' wastewater reaches the pH probe in BOE's DAF equalization tank, they have a limited ability to adjust it. If the pH is too low, Mr. Osbahr told us, they can add sodium bicarbonate (a weak base) to the equalization tank to bring the pH up. If the pH is *very* low, they would need to move a

crane into the area in order to handle the large amounts of bicarbonate required to neutralize it.

During our inspection at the CHS facility, I asked Mr. Oehler to provide a copy of their hourly effluent pH records for December, when the last pH excursion was reported. The next week, I received a copy of the hourly discharge pH records for December and January (through Jan. 12, 2017). The recorded pH values ranged from 2.04 to 12.53. Ten percent of the hourly pH values were outside the range of 5.0 - 9.5. These readings are from the pH probe in the kidney loop for the neutralization system. The pH is not measured at the point where the effluent is discharged to the sewer, except once per month when the City of Sioux City collects a grab sample.

Mr. MacClure attributed the low pH discharges in December to a problem with the kidney loop on the pH neutralization system. The wastewater in the loop had frozen solid, preventing the water from flowing past the pH probe. To remedy this, insulation was installed around the pipe (photo 17).

The cause of the high pH wastewaters in mid-December through early January was not discussed.

After this inspection, Ms. McCaslen forwarded me another report from CHS. On January 29, their hydrochloric acid pump failed and high pH wastewater was discharged for 13 hours.

The City's monthly effluent pH measurements have not indicated a violation since 2012. The data for December and January provided by CHS paint a different picture, however, with frequent excursions outside the permitted pH range. And since these data are hourly averages, they smooth out any shorter-term fluctuations and may under-report the number and magnitude of pH swings. It should also be noted that, since pH values are not actual concentrations, the mean or average pH is not a meaningful statistic. The pH probe in the neutralization system is monitored through the plant-wide SCADA (supervisory control and data acquisition) system. There are no alarms for high or low pH, but, according to Mr. MacClure, the SCADA screens are closely monitored by plant staff. Nevertheless, CHS staff do not appear to have adequate control over the pH of the wastewater they discharge.

On occasion, CHS has bypassed their pH neutralization system. It happens when the equalization tank is filled to capacity and overflows. These overflows discharge directly to the sewer. Mr. MacClure said that CHS is considering adding a backup pump to prevent overflows if a pump goes down.

*Recommendations:* Between CHS and BOE, there must be an agreement about how to better monitor and/or control the pH of wastewater leaving the CHS facility and/or entering the BOE facility. Mr. Osbahr said that they are currently looking at installing a dosing tank at the point where wastewater enters the BOE plant, with a pH probe and caustic feed. If this option is pursued, the City must also be on board, since the transport of corrosive wastewaters to BOE could adversely impact their collection system and violates the sewer use ordinance.

CHS should upgrade its pretreatment system to provide better effluent pH control. Complete loss of pH control has occurred on multiple occasions due to pump or pH probe failures which were not corrected for days. CHS should consider installing redundant systems. They should also monitor the pH of their wastewater downstream of the neutralization tank, e.g., at the point where it is discharged to the sewer. They should install an alarm to notify operators when the pH is out of the control range. They should also consider installing a larger neutralization tank and/or an additional tank where high or low-pH wastewater can be diverted and held until it is fully neutralized.

**5. Discharges to BOE from BPI & RMI:** I asked Ms. McCaslen about the compliance record of the other two permitted industries contributing wastewater to BOE. She said that BPI has a large capacity, well-operated DAF system. She said that except for one or two exceedances for fats, oil and grease (FOG) in the last 10 years, the facility has had a good compliance record. RMI also has a good compliance record, after having significantly reduced their discharges of suspended solids in accordance with a compliance schedule.

**6. Sulfide/$H_2S$ Monitoring by BOE:** Attachment 18 is a log sheet used to record hourly total and dissolved sulfide concentrations in the DAF effluent and a downstream manhole in the collection system. Included are all of the sheets generated since the previous Wednesday evening when the plant was started up. Twenty-nine samples of the DAF effluent were analyzed for sulfides over 6 days (17 work shifts). Concentrations up to 3 mg/L of total sulfides were reported right after startup, but they were generally $\leq 0.3$ mg/L since then. On some shifts, the effluent was monitored almost every hour, while on others, not at all. Some sulfide measurements (18) were also made at a downstream manhole ("Dakota City"), with concentrations as high as "5.5+" mg/L, but they generally declined to $\leq 0.3$ mg/L over the next few days. Effluent pH levels were very stable and generally close to 7 (6.16 to 7.2) at the discharge point and downstream manhole.

Mr. Osbahr said that the ferric chloride used in the DAF system removes sulfides from the wastewater in the form of ferrous sulfate. There were also more than twenty 300-gallon totes on hand in the plant containing 50% hydrogen peroxide solution. These were on hand for dosing the effluent, as necessary, to control hydrogen sulfide generation in the collection system. After this inspection, Mr. Osbahr told me that these containers had been relocated to the Roth Lift Station to be used there, if needed.

Mr. Osbahr also showed me a log sheet which was used by plant staff to monitor odors and $H_2S$ gas in the surrounding area and in the collection system between the plant and the Bennet Lift Station. Attachment 17 is a copy of the log sheets completed during the overnight shift ending at 6 a.m. on January 10. The accompanying map shows the route followed and five locations to be checked. The log sheet shows four of these locations were checked four times during the night shift on January 9-10. On two occasions, sulfide levels were checked in the sewer (.3 ppm, 0.7 ppm) and corresponding $H_2S$ levels were estimated (0.12 & 0.19; units not specified). No $H_2S$ readings were taken. Odor was reported once at the downstream manhole on Dakota Avenue.

During the walk-through inspection on January 10, we experienced some mild discomfort from the odor inside the plant. A dosimeter being worn by one of the workers registered an $H_2S$ level of 0.5 ppm. The OSHA Permissible Exposure Limit is 10 ppm. Mr. Osbahr said that they had some electronic issues with the ozonation system meant to mitigate odors inside the plant. Large portable fans had been brought in but were not being used at the time. When I spoke with him by phone on February 1, he said that a new 1500 cfm passive air scrubbing system had been installed. The air is passed through a biofilter before it is discharged.

I asked Mr. Livermore if there were any SSOs reported in South Sioux City's collection system. He said that they had reported one at the BPI lift station. The pump controls had malfunctioned, resulting in a discharge to the adjacent ditch. The controls were subsequently upgraded and an autodialer was installed, he said.

**7. Other Inspection Observations:** On November 2, BOE ceased processing of industrial wastewater for 62 days. We arrived on the sixth day after they had resumed processing. The DAF system was up and running. The next day (Wednesday), only one side was running and on Thursday, the DAF was

completely shut down. A consultant from US Water was on site conducting jar tests and adjusting the operating parameters. On Wednesday, the DAF effluent appeared much better than it had on Tuesday (photo 8). The consultant said that he had switched to a different polymer which performed better and would reduce the amount of ferric chloride used. He was waiting for parts to arrive to make necessary modifications to the chemical feed system.

The digesters were producing methane gas at about 40% of capacity on Wednesday when we inspected the plant. At full capacity, it is expected to generate around 1 million cubic feet of gas per day and 30-40 wet tons of sludge.

Mr. Osbahr said that the consultant from US Water is on site 2 days a week and is training BOE employees to do the jar tests and monitor DAF operations. The availability of qualified operators is critical for the safe and effective operation of the DAF and digesters, especially in light of their potential environmental impacts on the surrounding community. Mr. Osbahr was on site throughout this inspection and answered all of our questions about facility operation, design, and capacity. He lives in Des Moines (a 3-hour drive) and also oversees three other industrial energy production facilities in Iowa. He is at the BOE facility 3 to 4 days a week, he said. Mr. Winkler was on site but did not participate in the discussions.

Ms. McCaslen noted that since BOE resumed their wastewater processing last week, the Sioux City STP had been adjusting to the resulting reduction in food/microorganism (F/M) ratio in their activated sludge process.

Every tank has probes to continuously monitor pH and temperature. The probes were last calibrated on Thursday, December 5, according to Mr. Osbahr. There are also several turbidity meters throughout the plant, including on the DAF effluent. He said that these were not reading accurately, however, and were in need of re-calibration.

**8. EPA Sample Results:** Following are the pollutant concentrations reported by the Region 7 Science and Technology Center laboratory for the three samples collected during this inspection (units=mg/L):

| Parameter | Sample 1 (grab) DAF Effluent; 01/10/17 | Sample 2 (composite) Effluent Pit; 01/10/17 | Sample 3 (composite) Effluent Pit; 01/11/17 |
|---|---|---|---|
| BOD | 1970 | 2380 | 2380 |
| COD | 3590 | 4420 | 4320 |
| TSS | 697 | 813 | 564 |
| TKN | 410 | 456 | 337 |
| Ammonia-N | 278 | 300 | 212 |
| Nitrate/nitrite-N | .229 | .063 | .132 |
| pH | 6.83 | - | 6.93 |

The volume of wastewater discharged on January 10 was 1.65 MGD and the plant was on pace to treat the same volume the following day. The composite samples (samples 2 and 3) had BOD and TSS concentrations similar to those being reported in September and October before BOE stopped accepting, treating, and discharging industrial wastewater.

I contacted Ms. McCaslen on January 27 for an update on the status of the BOE facility. She said that the last sample of their effluent was fairly clear in appearance and had no detectable sulfides. She also provided me with effluent sample results for January (included in Attachment 14). Effluent TSS and

BOD levels are similar to those being reported in September and October before the DAF was shut down.

**9. Storm Water Pollution Prevention Plan:** BOE's Notice of Intent was received on June 20, 2016, and acknowledged on July 26, 2016. Nebraska's current storm water general permit (NER910000) was issued by NDEQ on July 18, 2016, and expires on June 30, 2021. Attachment 4 is a copy of the SWPPP given to me by Mr. Osbahr on January 11. He did not have a signed copy of the SWPPP and some of the information in it was out of date. For example, neither of the two individuals listed as responsible for implementing and overseeing the storm water program are currently employed by BOE. Mr. Osbahr said that the SWPPP is currently being revised by their contract engineer (McMahon Engineers and Architects) and that Mr. Winkler, the plant manager, is currently in charge of SWPPP implementation.

The permit requires quarterly benchmark monitoring of storm water discharges for at least the first four quarters of operation. The BOE facility is required to monitor for TSS, COD, and ammonia. Since BOE has been in operation since September 2, benchmark monitoring should have been done sometime during the fourth quarter of 2016. The permit also requires quarterly site storm water inspections. There were no records of any storm water inspections being conducted. I issued a Notice of Potential Permit Violations for these deficiencies (Attachment 5).

When we inspected the area surrounding the plant, we observed frozen puddles of an unidentified dark-colored liquid along the edge of the paved drive approaching the bay where waste tankers unload on the north side of the plant. On February 1, Mr. Osbahr told me that the liquid had been cleaned up. Mr. Osbahr told us that all the drains in the building lead to the 300,000-gallon equalization basin that feeds the DAF system. Any spills that occur would be contained. No area drains were observed on the property outside the building.

On February 2, I received, from BOE's attorney, a copy of a response letter from Mr. Osbahr, which had already been submitted to CNSL with their §308 request response. On February 7, I received additional documents, including new forms for documenting facility/site inspections, spills, and quarterly visual assessments, along with NDEQ's Storm Event Monitoring Report Form. The NOPV response and related documents are in Attachment 19.

**10. Discharges from Other Industries to South Sioux City's Collection System:** Several other industries are located in South Sioux City and discharge to the collection system. Discharges of BOD, FOG, sulfates, and/or low-pH effluent from these industries could potentially generate $H_2S$ in South Sioux City's gravity sewers. Attachment 16 is a list of industries given to us by Ms. McCaslen. We briefly discussed each of these.

ADM Alliance Nutrition manufactures molasses licks for livestock and discharges 7,000 to 20,000 gpd. The Sioux City pretreatment program sampled their wastewater in November 2013 and July 2016. The results of the sample analyses are included in Attachment 16. BOD concentrations ranged from 3000 to 8000 mg/L; TSS from 500 to ~8000 mg/L; FOG from 44 to 115 mg/L; and pH from 5.8 to 8.5. For comparison, a sample of raw molasses was also collected and analyzed (TSS = 303,000 mg/L and BOD = 135,000 mg/L). Since mid-November, the City has been dosing the sewer just downstream of ADM with hydrogen peroxide (5000-gallon tank-photo 1).

Bimbo Bakeries is a wholesale bakery and has a pretreatment permit issued by Sioux City. They discharge approximately 15,000 gpd of industrial wastewater. Ms. McCaslen's records (Attachment 16) show that they discharged wastewater with a pH below 5 during two months in 2012, but have been in

compliance for the last 4 years.

Both ADM and Bimbo Bakeries have oil/water separators which are regularly maintained as reported by Sioux City's FOG coordinator. Historically, wastewater from these two industries had flowed north in a gravity line to the Foundry Lift Station. In July, they were re-routed into the gravity line flowing east along 39th Street. In November, when the rubber plug was installed in that line, the industrial flows were again diverted north with the residential flows. After construction of the new industrial force main, the plug was removed and these flows have returned to their original route east through the 39th Street gravity line.

Flatwater Metals is a metal finishing facility. Ms. McCaslen said that they had returned a sewer use survey and she was planning a site visit in the next few weeks. Barto Trucking and Sioux Plating are permitted by the Sioux City pretreatment program. Their discharges are conveyed north to the Riverlift Lift Station and are not connected to the collection system for the Bennet Lift Station. There is a truck wash north of the Tyson facility. The wash-water is treated in an onsite lagoon and they do not discharge to the city sewer.

## CONCLUSIONS

1. Although the plant manager, Perry Winkler, was present during this inspection, all of the information in this report was provided by Jason Osbahr, the plant engineer. Mr. Osbahr's knowledge of the facility is extensive, but he resides ~3 hours away and is responsible for three other energy plants in the state of Iowa. Since the plant started up, staff turnover has been significant. BOE must ensure that the plant is staffed and supervised around the clock by competent personnel trained to respond to plant upsets or any other exigencies.

2. Repeated slugs of industrial wastewater with extremely low pH levels were received in September and probably contributed to the plant upset at BOE and subsequent sulfide and odor issues. Effluent controls at CHS are not adequate to maintain effluent pH between 5.0 and 9.5, as required by South Sioux City's sewer use ordinance. CHS and BOE should work together to address the issue of acidic/alkaline wastewater either at CHS' discharge point and/or at the BOE facility. To comply with the City's ordinance, CHS should upgrade their effluent pretreatment system by providing redundant controls, better monitoring, and/or greater equalization capacity to contain tank dumps and/or wastewater with low or high pH.

3. CHS', BPI's and RMI's pretreatment permits issued by the City of Sioux City expire in April 2017. By that time, the City of South Sioux City must put agreements in place with these industries to ensure their discharges are compatible with BOE and the Sioux City STP. There are several open questions and issues remaining to be worked out, such as BOE's treatment capacity and confidentiality agreements between the industries.

4. BOE is permitted under Nebraska's general storm water permit but failed to conduct the required quarterly storm water inspection and benchmark monitoring in the fourth quarter of 2016. A Notice of Potential Permit Violations was issued. BOE indicated, in their response, that the Storm Water Pollution Prevention Plan is being updated and the required monitoring would be started this quarter.

5. Effluent samples collected from the BOE facility during this inspection had pollutant concentrations consistent with monitoring results reported by the City of Sioux City over recent months.

Peter M. Green
Environmental Scientist
Activity Number: WGP424
Date: February 18, 2017

Attachments:

1. Maps/aerial photos of South Sioux City Collection System and Big Ox Facility (4 pages)
2. Pretreatment Permits (issued by Sioux City, Iowa) for CHS, BPI, RMI, ADM, and Bimbo Bakeries (8 pages)
3. Big Ox Energy Process Flow Diagrams (2 pages; 8½" x 11" and 11' x 17") (These documents were claimed as Confidential Business Information and are being stored in Region VII's CBI repository)
4. Big Ox Energy Storm Water Pollution Prevention Plan (26 pages) and Attached Nebraska General Storm Water Permit (43 pages)
5. Notice of Potential Permit Violations (1 page)
6. Signed Confidentiality Statement (1 page)
7. Photos Taken During Inspection, with Captions (20 pages)
8. Region VII Multimedia Screening Checklist (2 pages)
9. Transmittal of Sample Analysis Results; Region VII Science & Technology Center Laboratory (6 pages)
10. Pretreatment Permit (issued by Sioux City, Iowa) for Big Ox Energy (6 pages)
11. Pretreatment Permit Application for Big Ox Energy (June 8, 2015) (9 pages)
12. Amended Pretreatment Permit for Big Ox Energy (7 pages)
13. Industrial Wastewater Monthly Billing Spreadsheets; CHS, BPI, & RMI; September 2016 through January 2017 (15 pages)
14. Industrial Wastewater Monthly Billing Spreadsheets; Big Ox Energy; September 2016 through January 2017 (6 pages)
15. January Flow Records for Big Ox Energy (2 pages)
16. South Sioux City Industry Contacts, Compliance History, and ADM Sample Results (4 pages)
17. Big Ox Energy Shift "Rounds" Log Sheets for January 9-10, 2017, with Map of Route (5 pages)
18. Big Ox Energy Shift Log Sheets for January 5-10, 2017; Effluent Sulfides & $H_2S$ (8 pages)
19. Big Ox Energy Response to NOPV (received February 2&7, 2017) (19 pages)